

REMARKS

Applicant have carefully considered the May 26, 2004 Office Action, and the amendments above together with the comments that follow are presented in a bona fide effort to address all issues raised in that Action and thereby place this case in condition for allowance. Claims 36-50 are pending in this application. Claims 36-43 have been withdrawn from consideration pursuant to the provisions of 37 C.F.R. § 1.142(b). The Examiner is requested to acknowledge the current disposition of claims in the next Office communication.

In response to the Office Action dated May 26, 2004, claims 44, 47, 48 and 50 have been amended. The specification and claims have been amended to replace the misspelled term "propyronic acid" with the correctly spelled term "propionic acid". Care has been exercised to avoid the introduction of new matter. Adequate descriptive support for the present Amendment should be apparent throughout the originally filed disclosure, depicted embodiments and claims. Entry of the present Amendment is respectfully solicited. It is believed that this response places this case in condition for allowance. Hence, prompt favorable reconsideration of this case is solicited.

Applicant submits concurrently herewith, a copy of the three documents cited on the October 17, 2003 Information Disclosure Statement which were not considered by the Examiner. The Examiner is requested to consider these documents and forward Applicant an appropriately initialed copy of form PTO-1449 with the next Office communication.

The Examiner objected to claim 44 asserting informalities with respect to the weight of the vehicle-binder. Applicant has amended claim 44 to recite that the ratio is 1.15:1. Accordingly, the objection of claim 44 should be withdrawn.

Claims 47 and 50 were objected to because of the use of the limitation "propyronic acid" in the claims. Applicant has amended the claims to recite the correct spelling of the term "propionic

acid". The specification has also been amended to correct the spelling of the term "propionic acid" for consistency. Accordingly, the objection of claims 47 and 50, as well as the objection to the specification, should be withdrawn.

Claims 44 and 48 were rejected under 35 U.S.C. § 112, second paragraph. The Examiner asserted that the term "relatively small" is a relative term which renders to claim indefinite. Applicant has removed the term from the claims. Accordingly, the rejection is moot.

Claims 48 and 50 were rejected under 35 U.S.C. § 112, first paragraph. The Examiner asserted that the specification only teaches one half percent by weight of the propionic acid and no other amount are disclosed for the propionic acid. Applicant respectfully traverses.

Applicant submits that the disclosed one half percent of a dispersing agent, such as propionic acid, is a preferred embodiment, as indicated on pages 5 and 9 of the specification. In order to satisfy the written description requirement, the disclosure must convey with reasonable clarity to those skilled in the art that the inventor was in possession of the invention. The written description requirement is satisfied when one skilled in the art, reading the original disclosure, would reasonably discern the limitation at issue in the claims. Applicant submits that the independent claims should not be limited in scope to their preferred disclosed embodiments as asserted by the Examiner. Rather, one of ordinary skill in the art, with the supporting disclosure in hand, would clearly understand that various modifications and variations can be made to the disclosed embodiments which fall within the scope of the inventive concepts. Accordingly, the rejection is not legally sustainable and should be withdrawn.

The Examiner, at numbered paragraph 6 on page 3 of the Office action, questioned whether the potassium silicate vehicle-binder is a dispersion and whether the weight ratio of pigment to vehicle binder is based on the weight of the silicate or the dispersion. Applicant submits that the

potassium silicate is premixed and dissolved in a de-ionized water solution (i.e. Kasil® 2130). See specification at page 10, lines 6-7. When the potassium silicate vehicle binder is mixed with the pigment, a dispersion is formed. Thus, claims 44 and 48 have been amended to clarify that the weight ratio of pigment to weight of binder applies to the paint coating (dispersion). Applicant submits that he has addressed the Examiner's inquiry and traversed the rejection of claims 44 and 48 under the second paragraph of 35 U.S.C. § 112 at page 3 of the Office action. Indeed, one having ordinary skill in the art would not have difficulty understanding the scope of the presently claimed subject matter, particularly when reasonably interpreted in light of the supporting specification. Therefore, it is respectfully submitted that the imposed rejection of claims 44 and 48 under 35 U.S.C. § 112, second paragraph, is not legally viable and hence, solicit withdrawal thereof.

Claims 44-46 ad 48-49 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Babel et al. (U.S. Pat. No. 5,296,285, hereinafter "Babel"). Applicant respectfully traverses the rejection.

Claims 44-46 ad 48-49 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Terry et al. (U.S. Pat. No. 3,769,050, hereinafter "Terry"). Applicant respectfully traverses the rejection.

Applicant traverses each of the rejections under 35 U.S.C. § 103(a) and assert that neither reference discloses or fairly suggests the coating material of independent claim 44 wherein the pigment comprises a predominant proportion of uncalcined zinc-oxide. Moreover, the references are silent as to a water soluble paint of independent claim 48, wherein the pigment consists essentially of uncalcined zinc-oxide. Indeed, both Babel (col. 4, lines 8-25) and Terry (abstract and col. 2, lines 11-17) disclose heat-treated (calcined) zinc-oxide particles in their compositions.

It is well established, that in rejecting a claim under 35 U.S.C. §103 the Examiner is required to point to a source in the applied reference for each claim limitation and a source for the requisite motivational element. Moreover, in imposing a rejection under 35 U.S.C. §103, the Examiner is required to make a "thorough and searching" factual inquiry and, based upon such a factual inquiry, explain why one having ordinary skill in the art would have been realistically impelled to modify particular prior art to arrive at the claimed invention. Neither burden has been discharged. The Examiner has failed to identify where either reference discloses or remotely suggests a pigment comprising a predominant proportion of uncalcined zinc-oxide, or a water soluble paint wherein the pigment consists essentially of uncalcined zinc-oxide as required in claims 44 and 48, respectively.

Accordingly, Babel and Terry each fail to disclose or remotely suggest every claimed feature of independent claims 44 and 48 and, therefore, the rejections of claims 44-46 and 48-49 under 35 U.S.C. § 103(a), are not legally viable and should be withdrawn.

Applicant gratefully acknowledges the Examiner's indication of allowable subject matter. Claim 47 was indicated as allowable if recast in independent form and amended to overcome the rejection under the second paragraph of 35 U.S.C. § 112. Applicant has rewritten claims 47 in independent form to include the limitations of claim 44. Applicant submits that claim 47 is in condition for allowance.

Applicant notes the Examiner's Statement of Reasons for Allowance included on page 6 of the Office action. Entry of that Statement into the record should not be construed as any agreement with or acquiescence by Applicant in the stated reasoning. The claim discussed has been allowed without narrowing from its original scope. The Statement of Reasons for Allowance should not be used to interpret the cited claims.

No.: 10/686,575

It is believed that all pending claims are now in condition for allowance. Applicant therefore respectfully requests an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicant's representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT WILL & EMERY LLP



Brian K. Seidleck
Registration No. 51,321

600 13th Street, N.W.
Washington, DC 20005-3096
202.756.8000 BKS:apr
Facsimile: 202.756.8087
Date: September 27, 2004

MATERIAL SAFETY DATA SHEET

Z93-P Kit

Identity (Trade Name As Used On Label)

Manufacturer: IIT Research Institute (IITRI)	MSDS Number: Z93-P Kit.doc
Address: 10 West 35th Street Chicago, IL 60616	CAS Number: N/A
	Date Prepared: January 2000
Emergency Telephone Number: 1-800-255-3924	Prepared By: M.S. Deshpande
	Telephone Number: 312/567-4290



Z93-P THERMAL CONTROL COATING KIT

Z93-P Thermal Control Coating is sold as a kit consisting of the following parts:

- A. Z93-P Part A Pigment
- B. Z93-P Part B Binder Solution

Material safety data sheets are attached for each of the above parts.

SECTION 3: FIRE AND EXPLOSION HAZARD DATA

Flash Point and Method Used N/A	Auto Ignition Temperature N/A	Flammability Limits in Air % by Volume: LEL N/A	UEL N/A
------------------------------------	----------------------------------	---	------------

Extinguisher Media: CO₂, dry chemical, foam, water mist.

Special Fire Fighting Procedures: Wear full protective clothing and self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Emits toxic fumes under fire conditions.

SECTION 4: REACTIVITY HAZARD DATA

Stability <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable	Conditions to Avoid: N/A
Hazardous Polymerization <input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur	Incompatibility (Materials to Avoid): Magnesium, linseed oil, chlorinated rubber. Hazardous Decomposition Products: N/A

SECTION 5: HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Skin Absorption	<input checked="" type="checkbox"/> Ingestion <input type="checkbox"/> Not Hazardous	CARCINOGEN LISTED IN	<input type="checkbox"/> NTP <input type="checkbox"/> IARC Monograph	<input type="checkbox"/> OSHA <input checked="" type="checkbox"/> Not Listed
-------------------------	---	---	----------------------	---	---

HEALTH HAZARDS	Acute:	Cough, dyspnea, skin and eye irritation.
	Chronic:	Metal fume fever, pulmonary effects, dermatitis, mutagen.

Signs and Symptoms of Exposure: Cough, chest tightness, fever, eye and skin irritation.

Medical Conditions Generally Aggravated by Exposure: Respiratory ailments, skin conditions.

Emergency First Aid Procedures

Eye Contact:	Flush eyes with water for minimum of 15 minutes; seek medical attention.
Skin Contact:	Wash with soap and water; seek medical attention if irritation persists.
Inhalation:	Remove to fresh air; if not breathing, give artificial respiration; seek medical attention.
Ingestion:	If person is conscious, wash out mouth with soap and water; seek medical attention. Never give anything by mouth to an unconscious person.

SECTION 6: CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (Specify Type): Use NIOSH-approved respirator with HEPA filter(s).

Protective Gloves: Gloves made of non-reactive materials

Eye Protection: Goggles

VENTILATION TO BE USED	Local Exhaust: Recommended	General Exhaust: Not advised	Special: N/A
------------------------	----------------------------	------------------------------	--------------

Other (specify): N/A

Other Protective Clothing and Equipment: N/A

Hygienic Work Practices: Ensure eye wash and safety shower are nearby.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE/LEAK PROCEDURES

Steps to be Taken if Material Is Spilled or Released:

Wear proper protective clothing and respirator; scoop up and place in waste container.

Waste Disposal Methods:

Disposal must be made in accordance with federal, state, and local regulations.

Precautions to be Taken in Handling and Storage:

Avoid inhalation; avoid contact with eyes, skin, clothing, keep tightly closed.

NFPA Rating (Optional)

Health N/A

Flammability N/A

Reactivity N/A

Special N/A

All chemicals produced or supplied by IIT Research Institute (IITRI) are evaluated for their hazards according to 29 CFR 1910.1200. Individual chemicals are evaluated based on current scientific data concerning their hazards. Chemical mixtures are evaluated based on current scientific data for their chemical constituents. Mixtures are assumed to present the same health hazards as their constituents. Physical hazards for mixtures are determined based on whatever scientifically valid information is available. Material safety data sheets (MSDSs) for the constituent chemicals are typically consulted when preparing MSDSs for mixtures. If a mixture contains greater than 0.1% of a known carcinogen, the mixture is assumed to be carcinogenic. Furthermore, if a mixture contains less than 1.0% of a chemical (or 0.1% of a carcinogen) but may result in workplace exposures above the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and/or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for that chemical, the mixture is assumed to present the same hazard.

While every effort has been made to present accurate information, this MSDS is provided without any representation of warranty, express or implied, regarding the accuracy or correctness.

The conditions or methods of storage, use, and disposal of the product are beyond the control of IITRI and may be beyond our knowledge. For this and other reasons, IITRI does not assume responsibility, and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of this material.

IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

Identity (Trade Name As Used On Label)

Telephone Number: 312/567-4290

SECTION 2: FIRE AND EXPLOSION HAZARD DATA

Flash Point and Method Used N/A	Auto Ignition Temperature N/A	Flammability Limits in Air % by Volume: LEL N/A UEL N/A
------------------------------------	----------------------------------	---

Extinguisher Media: CO₂, dry chemical, foam, water mist.

Special Fire Fighting Procedures: Wear full protective clothing and self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Emits toxic fumes under fire conditions.

SECTION 3: REACTIVITY HAZARD DATA

Stability <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Unstable	Conditions to Avoid: N/A
Hazardous Polymerization <input type="checkbox"/> May Occur <input checked="" type="checkbox"/> Will Not Occur	Incompatibility (Materials to Avoid): N/A Hazardous Decomposition Products: SiO ₂ , K ₂ O

SECTION 4: HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY	<input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Skin Absorption	<input type="checkbox"/> Ingestion <input type="checkbox"/> Not Hazardous	CARCINOGEN LISTED IN	<input type="checkbox"/> NTP <input type="checkbox"/> IARC Monograph	<input type="checkbox"/> OSHA <input checked="" type="checkbox"/> Not Listed
-------------------------	---	--	----------------------	---	---

HEALTH HAZARDS
Acute: Tissue irritation, respiratory irritation.

Chronic: Dermatitis, respiratory ailments.

Signs and Symptoms of Exposure: Skin and eye irritation.

Medical Conditions Generally Aggravated by Exposure: Dermatitis, respiratory disorders.

Emergency First Aid Procedures

Eye Contact: Flush eyes with water for minimum of 15 minutes; seek medical attention.

Skin Contact: Wash with soap and water; seek medical attention if irritation persists.

Inhalation: Remove to fresh air; if not breathing, give artificial respiration; seek medical attention.

Ingestion: If person is conscious, wash out mouth with soap and water; seek medical attention. Never give anything by mouth to an unconscious person.

SECTION 5: CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (Specify Type): Use NIOSH-approved respirator with HEPA filter(s).

Protective Gloves: Rubber

Eye Protection: Goggles

VENTILATION TO BE USED

Local Exhaust: Recommended

General Exhaust: Not advised

Special: N/A

Other (specify): N/A

Other Protective Clothing and Equipment: N/A

Hygienic Work Practices: Ensure eye wash and safety shower are nearby.

SECTION 7: PRECAUTIONS FOR SAFE HANDLING AND USE/LEAK PROCEDURES

Steps to be Taken if Material Is Spilled or Released:

Wear proper protective clothing and respirator; absorb onto inert material; place in waste container.

Waste Disposal Methods:

Disposal must be made in accordance with federal, state, and local regulations.

Precautions to be Taken in Handling and Storage:

N/A

NFPA Rating (Optional)

Health N/A

Flammability N/A

Reactivity N/A

Special N/A

All chemicals produced or supplied by IIT Research Institute (IITRI) are evaluated for their hazards according to 29 CFR 1910.1200. Individual chemicals are evaluated based on current scientific data concerning their hazards. Chemical mixtures are evaluated based on current scientific data for their chemical constituents. Mixtures are assumed to present the same health hazards as their constituents. Physical hazards for mixtures are determined based on whatever scientifically valid information is available. Material safety data sheets (MSDSs) for the constituent chemicals are typically consulted when preparing MSDSs for mixtures. If a mixture contains greater than 0.1% of a known carcinogen, the mixture is assumed to be carcinogenic. Furthermore, if a mixture contains less than 1.0% of a chemical (or 0.1% of a carcinogen) but may result in workplace exposures above the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) and/or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for that chemical, the mixture is assumed to present the same hazard.

While every effort has been made to present accurate information, this MSDS is provided without any representation of warranty, express or implied, regarding the accuracy or correctness.

The conditions or methods of storage, use, and disposal of the product are beyond the control of IITRI and may be beyond our knowledge. For this and other reasons, IITRI does not assume responsibility, and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of this material.

IIT Research Institute
10 West 35th Street
Chicago, Illinois 60616

NOTICE: When ITRI drawings, specifications, or other data are used for any purpose other than in connection with a definitely related to the procurement operation, ITRI thereby incurs no responsibility or obligation whatsoever, and the fact that ITRI may have furnished, furnished, or in any way supplied the said drawing specifications or other data is not to be regarded by implication or otherwise as in any manner benefiting the bidder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Application		Part No.	MF	Revisions			
	Used on			Syn	Description	Date	Approval
					P. 1, 8	10/18/92	<i>gfe</i>

PAINT, 2-93 or 2-93P

TEMPERATURE CONTROL,

APPLICATION OF,

SPECIFICATION FOR

Original Date of Spec. 4/1/92		Paint, 2-93 or 2-93P, Temperature Control, Specification For	Advanced Materials & Coatings Laboratory IIT Research Institute (AMCL/IITRI) Chicago, IL 60616
Prepared by <i>gfe</i>	Date 4/1/92		
Checked by <i>gfe</i>	Date 4/2/92		
Reviewed by <i>gfe</i>	Date 4/2/92		
Approved/ Accepted	Date	Cage Code No. 03889	Specification No. IITRI-MD-C08089-SP10
To Main Files	Date		Sheet 1 of 13

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

1. SCOPE

1.1 Scope. This specification covers the detail requirements for process control and application of Z-93 temperature control paint to spacecraft hardware.

1.2 Classification. - The process covered by this specification consists of the following classes:

- (a) Class I - This class is designated for the majority of spacecraft hardware requiring temperature control treatment.
- (b) Class II - This class is designated for spacecraft hardware with an extremely complex configuration where strict control of the coating thickness is not practicable.

2. APPLICABLE DOCUMENTS

2.1 The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposals shall apply.

SPECIFICATIONS

Federal

TT-M-00261 Methyl Ethyl Ketone, for Use in Organic Coatings.

Military

MIL-P-27401 Propellant Pressurizing Agent, Nitrogen.

George C. Marshall Space Flight Center

10M01837 Paint, Z-93, Temperature Control, Specification for.

10M01838 Paint, Z-93, Temperature Control, Application of, Specification for.

IIT Research Institute

IITRI-MD-C08089-SP9 Paint, Z-93, Temperature Control, Specification for.

3. REQUIREMENTS

3.1 Temperature control paint requirements. - Temperature control paint, applied to spacecraft flight hardware in accordance with this specification, shall be as specified in Table I and shall have been certified by the cognizant temperature control materials engineer.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 2 of 13

FORM 100-1 (VERTICAL) (NOVEMBER 1961)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

Table I. Nominal conditions of applied paint.

Designation	Thickness per coat (mils)	Nominal thickness (mils)
IITRI-MD-C08089-SP9	2.00	5.0 \pm 1.0

3.2 Process control requirements. - Process controls shall be exercised in accordance with the following paragraphs.

3.2.1 Temperature control request form. - A temperature control request form or other suitable document shall be used to provide instructions to the operator, to record compliance to the requirements specified herein, and to achieve traceability. The form or document shall be completely filled in, including hardware serial numbers and spacecraft models. Special handling, control, or precautions shall be noted on the form or document.

3.2.2 Batch identification and control. - For the purpose of this specification, a batch of paint shall be considered as that supply of paint prepared expressly for painting a group of parts or hardware in one operation. The lot number of the paint used to make up a batch shall be recorded on the temperature control request form or a suitable planning document. Unless otherwise specified, two control samples shall be prepared, during the processing of parts, in accordance with 3.2.2.1. These samples shall be identified with the processed parts and shall be kept on record under the cognizance of the temperature control materials engineer and Quality Assurance personnel.

3.2.2.1 Batch sample preparation. - For thermal emittance testing, temperature control paint shall be applied to 1- by 3-inch 6061 aluminum plates 0.040 inch thick. For solar absorptance testing, the paint shall be applied to one-inch (nominal) diameter 6061 aluminum discs 0.040-inch thick. Surfaces shall be prepared as specified in 3.4.1. Requirements for samples with respect to their preparation, test methods, and limits of acceptability of optical and other property values shall be as described in Specification IITRI-MD-C08089-SP9.

3.2.3 Thickness. - The thickness per coat and the nominal thickness for the paint shall be as specified in table I. Thickness measurement for class I and class II processes shall be as follows:

- (a) Class I - Class I thickness measurements shall be made directly on the workpart, after the paint has been applied and cured, using the standard thickness gage measuring device and the measuring procedure specified in 4.3.3.
- (b) Class II - Class II thickness measurements for control of the paint spraying process, independent of the configuration of parts, shall be made on panel in the same paint spray application cycle and shall be cured in the same cycle along-side painting operations applied to the workpart.

3.2.4 Storage and shelf life. - The 24-hour shelf life of Z-93 paint shall not be exceeded. The shelf life of the paint shall be considered to begin at the time the ingredients are compounded. Paint used for project temperature control applications shall be assigned a project lot number and

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 3 of 13

FORM 123 (REVISED NOVEMBER 1962)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

shall be stored in an area identified and reserved for project temperature control paint. Only paint bearing project lot numbers shall be used in the process specified herein. The lot number of the paint shall be recorded on a traveler form or the temperature control request form with the concurrence of Quality Assurance personnel.

3.2.5 Hardware release. - Once a part has been submitted for processing, it shall not be released until it has completed the curing process specified in 3.4.4.

3.3 Cleanliness requirements. - The temperature control paint shall be applied in a facility specifically designed and constructed to serve as a thermal control paint application facility, to assure that the applied coating meets the requirements specified herein. Surface preparation, precleaning, inspection, storage, and operations subordinate to paint application shall be performed in an area adequately contamination controlled to assure compliance to the requirements specified herein. Adequate care shall be taken to avoid contamination of the coating and the flight hardware under all work conditions throughout the process specified herein. The temperature control paint shall not be applied prior to any mechanical operations such as machining, drilling, forming, or welding. Adhesive bonding on surfaces to be painted shall have been completed prior to paint application.

3.3.1 Handling of parts. - During and after any operation specified herein, parts shall be handled in a manner that will prevent biorganic substances, dust, or other foreign matter from contaminating the surfaces being processed. For the purpose of this specification, fingerprints, perspiration, dandruff, hair follicle, and saliva shall be considered biorganic contaminants. Adequate care shall be taken to avoid contamination of the coating and the flight hardware under all conditions throughout the process. In all cases, flight hardware shall be protected from random temperature extremes, high humidity, contamination, and physical damage. Clean conditions shall be observed within the requirements specified herein.

3.3.2 Paint facility cleanliness and environmental requirements. - The cleanliness and environmental conditions of the paint facility, used for the process specified herein, shall be in accordance with 3.3.2.1 through 3.3.2.4.

3.3.2.1 Temperature. - The paint facility shall be capable of maintaining the temperature at 75 ± 10 degrees Fahrenheit ($^{\circ}\text{F}$) during the processing of parts.

3.3.2.2 Humidity. - The relative humidity within the paint facility shall be maintained at a level greater than 50 percent during spraying and for at least 30 minutes following completion of spraying. Parts that have been removed from their protective packaging for painting shall be painted within 2 hours after removal.

3.3.2.3 Air flow. - Air flow within the paint booth shall be held to a minimum consistent with operator comfort. Immediately upon completion of the spraying operation, the parts shall be removed to an area wherein humidity can be maintained at the level specified in 3.3.2.2 and air flow can be held to zero.

3.3.2.4 Personnel protective precautions. - All precautions for personnel protection shall be observed to prevent the inhalation of fumes or dust generated by surface treatment and spray painting.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 4 of 13

FORM 723 (VERTICAL) (NOVEMBER 1967)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

3.4 Temperature control painting process requirements. - The standard process for the application of temperature control paint shall consist of surface preparation by chemical and mechanical methods, cleaning, masking of areas to be free of paint, paint application, and special handling of parts. Class I and class II temperature control paint application processes shall be performed as follows:

- (a) Class I. - Parts designated for class I temperature control paint application shall be processed in accordance with 3.4.1 through 3.4.6.
- (b) Class II. - Parts designated for class II temperature control paint application shall be processed in accordance with 3.4.1 through 3.4.6. A paint thickness sample representative of the part shall be processed in conjunction with the processing of the part as specified in 3.2.3 (b).

3.4.1 Surface preparation. - Surface preparation, to promote adhesion of the temperature control paint, shall consist of a chemical and mechanical process designed to produce an effective surface finish on the substrate. Surfaces shall be cleaned and prepared in accordance with the following procedure:

- (a) Solvent-wipe with methyl ethyl ketone conforming to Specification TT-M-00261.
- (b) Abraid using No. 60 Aloxite metal cloth (see 6.1 (j)), or dry grit blast with 100 to 150 grit aluminum oxide (see 6.1 (a)).
- (c) Clean with a 10 percent solution of Alconox (or approved equal) detergent (see 6.1 (g)), then rinse with distilled water until surface becomes water-break free.
- (d) Allow surface to dry thoroughly.
- (e) Apply paint within 48 hours following completion of surface preparation.

3.4.1.1 Postcleaning requirements. - Precautions shall be taken to minimize contamination of the cleaned surfaces prior to application of the temperature control paint. Cleaned parts may be covered in a protective wrapping of clean, neutral, unplasticized film material such as Tedlar (see 6.1 (b)). Parts shall be painted as soon as possible after final cleaning or after being removed from the clean protective wrapping, not to exceed the time specified in 3.4.1 (a).

CAUTION

All operations subsequent to cleaning shall be performed by personnel wearing clean cotton, Dacron, or nylon gloves. Handling of parts and assemblies shall be kept to a minimum. Gloves shall be changed with sufficient frequency to assure cleanliness.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 5 of 13

FORM 423 (REVISED NOVEMBER 1987)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

3.4.2 Masking. - Surfaces that are to be free of paint shall be masked with pressure sensitive tape (see 6.1 (c)). Masked surfaces may be on unpainted metal, unpainted plastic, or painted parts. Parts that are subject to damage by tape removal such as thin gage materials, thin plating, or surfaces subject to possible contamination by tape adhesive, i.e., dry film lubricants or optical components shall be so noted. Contact with temperature control surfaces shall be kept to an absolute minimum and the operator's hands shall be clean, since handling of the parts with clean, lint-free, dry, white gloves may not be feasible during masking operations. Parts and assemblies containing holes or fasteners shall be suitably masked during surface preparation, coating, and stripping.

3.4.2.1 Masking materials. - Pressure sensitive adhesive tape shall be used for the majority of the surfaces to be masked.

NOTE

This is a paper backed tape, available in widths of 1/4, 1/2, 1 and 2 inches.

A cellophane or mylar pressure sensitive adhesive tape of 1/2 mil nominal thickness may be used in special areas where a heavy buildup along the tape edge is undesirable.

3.4.2.2 Masking procedure. - Masking tape shall be applied in a manner that will seal all surfaces to be left unpainted or protected from paint overspray. Where contours exist, pulling of tape shall be avoided. Pressure shall be applied to seal progressively away from one end of the strip. Demasking or masking tape removal shall be performed carefully to avoid starting of pulling stresses in the paint coating. In the event masking tape adhesive remains on the untreated surface, the surface shall be cleaned, carefully, avoiding contact or contamination of the painted surface with solvents. To remove adhesive residue from the tape on a bare, unpainted surface, wipe the surface carefully with a swab of cotton or dacron saturated with kerosene or solvent, follow with a toluene wipe, and allow to dry.

3.4.3 Application. - The temperature control paint specified in Specification IITRI-MD-C08089-SP9 shall be applied to the surfaces to be treated in accordance with the requirements specified in the following paragraphs. The thickness for each coat of paint and the nominal coating thickness shall be as specified in Table I.

3.4.3.1 Equipment. - The following equipment (or approved equal) shall be used for the application of temperature control paint:

- (a) Spray booth, dry baffle or paint arrestor.
- (b) Spray gun equipped with pressure cup (see 6.1 (d)).
 - (1) Air cap (see 6.1 (d)).
 - (2) Fluid nozzle (see 6.1 (d)).
- (c) Strainer.
- (d) Viscosimeter, No. 2 Zahn cup.
- (e) Electronic thickness tester (see 6.1 (e)).
- (f) Nylon gloves or expendable cotton gloves.
- (g) Five micron air filter (see 6.1 (f)).

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 6 of 13

FORM 127 (VERTICAL) NOVEMBER 1967

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

(h) Ultraviolet lamp, long wave, 4 watts minimum.

3.4.3.2 Compounding of paint. - The temperature control paint specified in Specification IITRI-MD-C08089-SP9, shall be compounded in accordance with the following procedure. Strict adherence to the procedure shall be observed in order that the paint be suitable for the intended purpose.

3.4.3.2.1 Ingredients. - The ingredients identified below, in the amount specified, shall be used in compounding the paint. Substitution for any of the ingredients specified is strictly prohibited. The zinc oxide shall be calcined at $1200 \pm 50^\circ\text{F}$ for $16 \pm 1/2$ hours prior to compounding (the heating and cooling rates are not critical).

Ingredient	Ratio (grams)	
Zinc Oxide (SP-500)	500 ± 2	
Potassium Silicate (PS-7)	333 ± 1	
or		
Potassium Silicate (Kasil 2130)	390 ± 1	
Distilled Water	250 to 375	(dependent on spray viscosity requirements)

CAUTION

The porcelain ball mill used for grinding the paint as specified below, as well as the equipment specified in 3.4.3.1, must be absolutely clean before use in any application specified herein. It is desirable to use only new equipment. In the event this is not possible, all equipment shall be thoroughly cleaned with Alconox and subjected to ultraviolet inspection.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 7 of 13

FORM 423 (VERTICAL) (NOVEMBER 1982)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

3.4.3.2.2 Mixing. - Five hundred plus or minus two grams of calcined zinc oxide shall be placed in a 2-quart size porcelain jar and a premixed solution of 333 ± 1 grams of potassium silicate and 375 ± 1 grams of distilled water added. As a grinding media, 625 ± 10 grams of 0.5-inch diameter porcelain balls shall be added to the jar. No balls shall be observable above the paint level when the mill is charged. If observable, the excess shall be removed before starting the grind. The jar shall be tightly closed and placed on a jar rolling machine. The ingredients shall be ground for 6 hours at 70-percent critical speed. (Critical speed (revolutions per minute) is given by $W_c = 54.2/\sqrt{R}$, where R is the radius of the mill in feet.)

NOTE

If batch size necessitates the use of different capacity jars, the amount of ingredients and grinding media shall be adjusted accordingly while maintaining the formula ratios throughout. Grinding time, however, shall not be changed.

NOTE

Following experience can be used as guide to cut down grinding time: 300.00 \pm 2.0 gms of calcined zinc oxide shall be placed in size-00 porcelain jar with premixed solution of 199.5 ± 1 gm of potassium silicate and 225.00 ± 1 gm of distilled water (usually provided premixed). As a grinding media, 500 \pm 10 gms (0.5 inch diameter) porcelain balls shall be added. The jar shall be tightly closed before starting the grinding. The jar then can be rolled on jar-rolling machine at 90 \pm 10 rpm for 30 to 40 minutes to achieve uniform consistency.

At the end of the grinding period, the mill charge shall be removed and screened through double layers of cheesecloth. The paint shall be stored in a clean, tightly closed polypropylene container.

NOTE

Some hard pigment agglomerates may result from this process and shall be completely screened off and discarded.

3.4.3.3 Preparation. - The paint shall be mixed thoroughly prior to removing the paint from the container. (This is necessary due to the tendency of the paint to settle during storage.)

3.4.3.3.1 Thinning to spraying consistency. - The paint shall be mixed and thinned to a spraying consistency using distilled water. The viscosity shall be measured at room temperature with a number 2 Zahn cup, and shall be within a range of 17 to 23 seconds. The paint shall be strained before application to the substrate.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 8 of 13

FORM 100 (REVISED NOVEMBER 1983)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

3.4.3.4 Pressure and gas. - Clean, dry, oil free nitrogen meeting the requirements of Specification MIL-P-27401 shall be used as a pressurizing gas for paint spraying. In order to provide a smooth coating, approximate pressure at the nozzle of the spray gun for the temperature control paint shall be 25 to 50 pounds per square inch (psi).

NOTE

Actual nozzle pressure will depend upon viscosity of the paint, size of paint reservoir, orifice at the nozzle, and length of pressurizing gas delivery hose.

3.4.4.1 Filter. - A 5-micron air filter (see 6.1 (f)) shall be inserted into the nitrogen pressurizing line to remove particulate matter and moisture.

3.4.3.5 Spray painting procedure. - Temperature control paint shall be applied over clean metal surfaces prepared in accordance with the procedures specified in 3.4 through 3.4.2.2. The paint shall be applied in the required viscosity range with the spray gun specified in 6.1. The line pressure and nozzle shall be adjusted to provide a smooth coating. Pressure required to obtain a uniform coating shall be determined by the operator. The coating shall be sprayed in a uniform thickness for each coat. The paint shall be applied to provide the nominal thickness per coat and the total nominal thickness specified in Table I. Brush paint may also be applied to selective areas for touchup by means of an appropriate size high grade paint brush with fine camel's hair, or equal.

3.4.4 Application and curing of coatings. - Application and curing of the coatings shall be as specified in the following paragraphs.

NOTE

Periodic swirling of the paint container during spraying is necessary to prevent pigment settling.

3.4.4.1 Fooq coat. - The spray gun shall be held a distance of 8 to 12 inches from and perpendicular to the surface. One quick pass shall be made to provide a wet, light coat barely covering the surface. The coating shall be allowed to flash-dry for several minutes prior to application of the first full coat.

3.4.4.2 First full coat. - Application of the first full coat shall be as follows:

- (a) From a distance of 8 to 12 inches apply a full coat (one horizontal pass plus one vertical pass) to obtain the thickness specified in Table I. The coating shall be applied such that the surface is wet evenly and is free of runs and sags.

CAUTION

Coating material must be applied as a continuous, wet film. If applied dry, adhesion will be impaired.

- (b) Flush the gun with distilled water immediately after application to minimize clogging effects.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 9 of 13

FORM 10-10 (REVISED NOVEMBER 1962)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

- (c) Flash-dry for several minutes prior to application of the second full coat. Spot check the thickness of the first full coat so that adjustment can be made in application of the second full coat to obtain the total film thickness specified in Table I.

3.4.4.3 Second full coat. - Application of the second full coat shall be as follows:

- (a) Apply the second full coat in the manner specified for the first full coat. If necessary, extra passes may be sprayed to build up the required film thickness. Cure in accordance with the following schedule:
- (1) Air dry the coating at room temperature for a period of 5 to 6 hours, at >50% relative humidity.
 - (2) Remove the specimens and cure at ambient conditions for 7 days in designated clean area. Proper care should be taken to assure avoidance of contamination of surface.

3.4.5 Reapplication. - Soiled or damaged surfaces may be recoated. Soiled surfaces shall be cleaned thoroughly with a dilute solution (2 ounces per gallon) of detergent (see 6.1 (g)) in distilled water. The detergent shall be applied with a clean sponge or clean, lint-free, soft cloth. The parts shall be rinsed thoroughly (repeatedly) with distilled water and dried. Surfaces shall not be cleaned, prior to reapplication, with organic solvent.

3.4.5.1 Reapplication to damaged surfaces. - Damaged or gouged surfaces (or areas requiring coating after assembly) shall be recoated by means of a camel's hair brush and shall be allowed to dry for 30 minutes between successive coats. A minimum of two successive coats shall be applied and cured in accordance with 3.4.4.

3.4.6 Special handling. - Service personnel shall be made aware of existence of the following:

- (a) Delicate components, especially if they protrude or are easily accessible to paint spray; electronics and components, thin gage materials, or other conditions requiring special handling.
- (b) Surfaces or components particularly sensitive to contamination by paint dust or specific contaminants shall be noted. Masking tape, hands, tools, or contaminants shall not be permitted contact with the painted surfaces.

3.5 Workmanship. - Adequate care shall be taken to avoid contamination of the coating and the flight hardware under all work conditions throughout the process. All details of workmanship shall conform to the best practice for high quality processing and painting. Parts shall be handled in a manner that will prevent fingerprints, dirt, dust, or other foreign matter from contaminating the surfaces being processed during and after any operation specified herein.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 10 of 13

FORM 1001 (VERTICAL) (NOVEMBER 1963)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the procuring activity. The procuring activity reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Paint thickness verification. - Subsequent to the application of paint and prior to demasking, the paint thickness shall be measured to verify that the requirements of 3.2.3 have been met.

4.3 Inspection. - Spacecraft flight hardware and parts processed in accordance with the requirements of this specification shall be inspected in accordance with the following paragraphs. The paint process shall be observed to verify that the requirements specified herein are enforced.

4.3.1 Prepainting inspection. - The parts and coating shall be visually inspected under magnification, as required prior to painting, for imperfections or defects. Inspection for contamination may also be made by means of long wave light (black light).

4.3.2 Visual inspection. - Painted surfaces shall be visually inspected for chips, cracks, nicks, discoloration, contamination, peel, wrinkles, blisters, foreign material, fingerprints, and general appearance. The painted surface shall be smooth, uniform, and adherent, and shall exhibit no discoloration.

NOTE

Discoloration is an indication of gross contamination.

4.3.3 Coating thickness inspection. - The paint thickness shall be measured on the part (on the sample for class II process) and recorded on the temperature control request form. Where reference samples are used (class II process), record the sample number on the temperature control request form.

NOTE

Where possible, paint measurements shall be made only with a clean polymer sheet between the Dermatron probe and the painted surface. If paint thickness is measured by other than direct Dermatron reading on the part, the inspection record shall clearly indicate the method used.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 11 of 13

FORM 42-1 (VERTICAL) (NOVEMBER 1962)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

5. PREPARATION FOR DELIVERY

5.1 Packaging and packing materials. - Film packaging material and protective wrapping shall consist of clean, neutral, unplasticized film. Film materials suitable for wrapping or covering painted surfaces are: Tedlar, Teflon FEP, or Mylar (see 6.1 (b)).

NOTE

Mylar is not directly heat sealable unless laminated with a polyethylene film.

Nylon C film bags (see 6.1 (h)), available with a plastic zipper may be used for parts not exceeding 18 by 18 inches overall dimension. Neutral paper (see 6.1 (i)) of negligible sulfur content may be used for external wrapping. Tape shall be used for closure.

5.2 Preparation for storage. - Parts that have been processed in accordance with this specification shall be wrapped in a suitable film material as specified in the preceding paragraph, and then placed in a carrying case, nylon C film bag, or wrapped in paper and sealed with tape as applicable.

6. NOTES

6.1 Approved products. - The following products, or approved equals, have been approved for use as specified herein.

- (a) Aluminum oxide grit - F and S Abrasive Co., 2017 3rd Ave., North, Birmingham, Alabama 35203
- (b) Tedlar, Teflon FEP, Mylar - E. I. Dupont de Nemours and Company, Buffalo, N. Y. 14207.
- (c) Pressure sensitive tape - 3M Company, Industrial Tape Division, St. Paul, Minnesota 55101.
- (d) Spray gun, Model No. 18; pressure cup, No. 80-210 or 80-212; fluid nozzle, No. 63B; air cap, No. 63P - Binks Manufacturing Co., 3114-44 Carroll Avenue, Chicago, Illinois 60612.
- (e) Dermatron - Unit Process Assemblies Incorporated, 53-17 37th Avenue, Woodside, N. Y. 14304 or Elcometer Instruments, Inc., Troy, Michigan 48083.
- (f) Five micron air filter - The De Vilbliss Company, 296 Phillips Avenue, Toledo, Ohio 33612.
- (g) Detergent - Alconox Incorporated, New York, N. Y. 10012.
- (h) Nylon C film bags - Crown Zellerbach Corporation, 1 Bush Street, San Francisco, California 94104.
- (i) Kraft paper - St. Regis Paper Company, Kraft Division, 150 East 42nd Street, New York, N. Y. 10017.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 12 of 13

FORM 32-10 (VERTICAL) NOVEMBER 1961

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

- (j) Aloxite cloth - Carborundum Co., Refractories Division, Perth
Amboy, New Jersey.

(Suggested changes together with suitable information should be directed
to the Preparing Activity at IITRI.)

Preparing activity:

Advanced Materials & Coatings Laboratory (AMCL)
IIT Research Institute
10 West 35th Street
Chicago, IL 60616

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP10
		Sheet 13 of 13

Notes published November 1962

PAINT, Z-93 or Z-93P

TEMPERATURE CONTROL,

SPECIFICATION FOR

125 #/pt

Original Date of Spec. 4/1/92		Paint, Z-93 or Z-93P, Temperature Control, Specification For	Advanced Materials & Coatings Laboratory IIT Research Institute (AMCL/IITRI) Chicago, IL 60616
Prepared by <i>[Signature]</i>	Date 4/1/92		
Reviewed by <i>[Signature]</i>	Date 4/2/92		
Approved/ Noted	Date		
Main Files		Cage Code No. 03889	Specification No. IITRI-MD-C08089-SP9
			Sheet 1 of 9

NOTICE: When ITAI drawings, specifications, or other data are used for any purpose other than in connection with a definitely related to the procurement operation, ITAI thereby incurs no responsibility or obligation whatsoever; and the fact that the ITAI may have formulated, furnished, or in any way supplied the said drawing specifications or other data is not to be regarded by implication or otherwise as in any manner relieving the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Applications		Part No.	MF	Revisions			
Part Assy	Used on			By	Description	Date	Approval
					P. 1.7	10/19/93	gh
					P. 2.4	7/15/94	gh
					P. 7	7/18/94	gh
					P. 8	12/6/94	gh

Code Mater. No.	DWG Size A	ITAI-MD-C0809-SP9
		Sheet 2 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

1. SCOPE

1.1 Scope. This specification covers Z-93 temperature control paints for use with spacecraft components.

2. APPLICABLE DOCUMENTS

2.1 The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposals shall apply.

SPECIFICATIONS

Federal

TT-M-00261

Methyl Ethyl Ketone, for Use in Organic Coatings.

Military

MIL-P-27401

Propellant Pressurizing Agent, Nitrogen.

STANDARDS

Federal

FED-STD-141

Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing.

George C. Marshall Space Flight Center

10M01837

Paint, Z-93, Temperature Control, Specification for.

10M01838

Paint, Z-93, Temperature Control, Application of, Specification for.

IIT Research Institute

IITRI-MD-
C08089-SP10

Paint, Z-93, Temperature Control, Application of, Specification for.

3. REQUIREMENTS

3.1 Qualification. - The paint furnished under this specification shall be a product that has been tested and has passed the qualification tests specified herein. Any change in the formulation of a qualified product will necessitate its requalification. Paints supplied under contract shall be identical, within manufacturing tolerances, to the product receiving qualification.

3.2 Physical properties. - The following requirements apply to paints supplied by the manufacturer in accordance with the provisions of 6.2.

3.2.1 Thermal emittance. - The total normal emittance (ϵ_n) of panels coated with paint (see. 4.3.2.4) shall be 0.80 minimum when tested in accordance with 4.3.1.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP9
		Sheet 3 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

3.2.2 Adhesion. - The paint covered by this specification shall not exhibit loss of adhesion. When tested in accordance with ASTM-D-3359-78, a cured paint coating shall demonstrate adhesion of 4A. (See Appendix A herein.)

3.2.3 Spraying properties. - The paint, when tested in accordance with 4.3.3, shall spray satisfactorily in all respects and shall show no running, sagging, or streaking. The dried film shall show no dusting or mottling and shall present a smooth uniform finish free from seediness.

3.2.4 Weight. - The weight of the paint covered by this specification when tested as specified in 4.3.4 shall be 14.0 to 15.0 pounds per gallon.

3.2.5 Viscosity. - The viscosity of the paint covered by this specification shall be within the range of 14 to 23 seconds when tested in accordance with 4.3.5 (Zahn cup No. 2) (ASTM-D-1084).

3.2.6 Solar absorptance. - The solar absorptance (α) of the panels coated with paint shall be 0.20 maximum when tested in accordance with 4.3.5.

3.2.7 Toxicity. - When used for its intended purpose and applied in accordance with Specification IITRI-MD-C08089-SP10, the paint shall have no adverse effect on the health of personnel.

3.2.8 Pot life. - The maximum pot life of the paint covered by this specification shall be 24 hours. Any paint not used within this period shall be discarded.

3.2.9 Shelf life. - The shelf life of the paint covered by this specification shall be 24 hours, when stored in sealed polypropylin containers at 75 \pm 15 degrees Fahrenheit ($^{\circ}$ F).

3.2.10 Thermal shock stability. - The coating shall meet the adhesion requirements of 3.2.2 when subjected to thermal shock cycling as specified in 4.3.7.

3.2.11 Vacuum-ultraviolet stability. The coating shall meet the solar absorptance requirements of 3.2.6 when subjected to vacuum-ultraviolet exposure as specified in 4.3.7.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the procuring activity. Inspection records of the examinations and tests shall be kept complete and available to the procuring activity as specified in the contract or order. The procuring activity reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to the prescribed requirements.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP9
		Sheet 4 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

4.2 Certification of tests. - The supplier shall promptly submit to the procuring activity at the point of delivery, when specified on the purchase order or otherwise, a certificate of tests, showing that the material conforms to the requirements specified herein. The certificate shall contain the procuring activity designation, the purchase order number, and the lot number so the certificate may be identified with the shipment.

4.3 Test methods. - Testing shall be performed in accordance with the following paragraphs to determine compliance with the requirements specified herein.

4.3.1 Thermal emittance. - The thermal emittance requirement of 3.2.1 shall be verified by measuring the total normal emittance of coated samples (see 4.3.2.3) using a Gier-Dunkle portable emissometer or approved equal.

4.3.2 Adhesion. - Following visual inspection of a cured inspection sample, immerse the inspection sample in warm (+25° to +35°C) deionized water for not less than 30 minutes. Rub vigorously with a surgical-gauze pad while holding the inspection sample under the water. The water shall remain clear, showing no signs of a chalky-white discoloration. Remove the inspection sample from the water bath (metal substrates only). After air drying the sample for 24 hours at room temperature, conduct an adhesion test in accordance with ASTM-D-3359-78, Method A (see Appendix A). The adhesion shall be in accordance with the requirements of 3.2.2 herein.

4.3.2.1 Sample preparation. - For solar absorptance testing, the temperature control paint shall be applied to three one-inch diameter 6061 aluminum discs 0.060-inch thick minimum. For thermal emittance testing, the temperature control paint shall be applied to three 1- by 3-inch 6061 aluminum plates 0.040 inch minimum. Surface preparation to promote adhesion of the coating shall consist of a chemical and mechanical process designed to produce an effective surface finish on the substrate. Preparation of the substrate shall be by the following method:

- (a) Solvent-wipe with methyl ethyl ketone conforming to Specification TT-M-00261.
- (b) Abraid using No. 60 Aloxite metal cloth.
- (c) Clean with a 3 percent solution of Alconox detergent, then rinse with distilled water until surface becomes water-break-free.
- (d) Allow surface to dry thoroughly.

4.3.2.2 Cleanliness requirements and handling of parts. - The paint shall be applied to the sample coupons in a clean-room facility, specifically designed and constructed to serve as a thermal control paint application facility, to assure that the applied coating meets the requirements specified herein. Surface preparation, precleaning, inspection, storage, and operating subordinate to application of the coating shall be performed in an area adequately contamination controlled to assure compliance to the requirements specified herein. Adequate care shall be taken to avoid contamination of the coating throughout the process specified herein. During and after any operation, the sample coupons shall be handled in a manner that will prevent biorganic substances, dust, or other foreign matter from contaminating the surfaces being processed. For the purpose of this specification,

Code Ident. No.	DWG Size A	UTRI-MD-C08089-SP9
		Sheet 5 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

fingerprints, perspiration, dandruff, hair follicles, and saliva shall be considered biorganic contaminants.

4.3.2.3 Compounding. - Compounding of paint shall be accomplished in accordance with the requirements of Specification IITRI-MD-C08089-SP10.

4.3.2.4 Coating. - Coating of the sample coupons shall be accomplished as follows.

4.3.2.4.1 Cleaning of equipment. - All spray equipment and containers shall be thoroughly cleaned and rinsed with distilled water to avoid contamination.

4.3.2.4.2 Mixing of coating. - Immediately before spraying, the coating material shall be thoroughly mixed to a uniform consistency, then filtered through double layers of cheesecloth to remove any agglomerates. Periodic swirling of the paint container during spraying is necessary to prevent pigment settling.

4.3.2.4.3 Pressurizing agent. - Spray equipment shall be pressurized with nitrogen conforming to Specification MIL-P-27401, Type I. Spray pressure shall be within a range of 25 to 50 pounds per square inch (psi). Equipment shall be adjusted such that uniform passes are obtained and overspray is held to a minimum.

4.3.2.4.4 Film thickness. - A dry film thickness of 1.5 to 2.5 mils shall be obtained by application of a "fog" coat and the first full coat. The second full coat shall produce a total dry film thickness of 5.0 \pm 1.0 mils.

4.3.2.4.5 Fog coat. - A wet, light fog coat shall be applied by spraying one quick pass with the gun held perpendicular to the surface at a distance of 8 to 12 inches. Flash-dry for several minutes prior to application of the first full coat.

4.3.2.4.6 First full coat. - Application of the first full coat shall be as follows:

- (a) From a distance of 8 to 12 inches apply a full coat (one horizontal pass plus one vertical pass) to obtain the thickness specified in 4.3.2.4.4. The coating shall be applied such that the surface is wet evenly and is free of runs and sags.

CAUTION

Coating material must be applied as a continuous, wet film. If applied dry, adhesion will be impaired.

- (b) Flush the gun with distilled water immediately after application.
- (c) Flash-dry for several minutes prior to application of the second full coat. Spot check the thickness of the first full coat so that adjustment can be made in application of the second full coat to obtain the total film thickness specified in 4.3.2.4.4.

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP9
		Sheet 6 of 9

FORM 427 (REVISED NOVEMBER 1967)

CONTINUATION SHEET

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

4.3.2.4.7 Second full coat. - Application of the second full coat shall be as follows:

- (a) Apply the second full coat in the manner specified for the first full coat. If necessary, extra passes may be sprayed to build up the required film thickness. Cure in accordance with the following schedule:

- (1) Air dry the coating at room temperature for a period of 5 to 6 hours, at >50% relative humidity.
- (2) Remove the specimens and cure at ambient conditions for 7 days in designated clean area. Proper care should be taken to assure avoidance of contaminated surface.

4.3.2.5 Protection of coating surfaces. - Upon completion of the final drying cycle, cover the surfaces of the coated samples with Teflon FEP or Tedlar (or approved equal) film. Store samples in a protected container until tested.

4.3.3 Spraying properties. - The paint shall be sprayed on an aluminum panel and allowed to dry for at least 24 hours. Observe for conformance to 3.2.3.

4.3.4 Weight. - The paint shall be weighed on balance scales to verify the requirements of 3.2.4.

4.3.5 Viscosity. - The paint viscosity shall be determined at room temperature, using a Number 2 Zahn cup, to verify the requirements of 3.2.5.

4.3.6 Solar absorptance. - The solar absorptance requirements of 3.2.6 shall be verified by measuring the reflectivity of coated samples (see 4.3.2.4), using a Gier-Dunkle Integrating Sphere Reflectometer (or approved equal) in the wavelength range of 0.25 to 4.0 microns.

4.3.7 Vacuum-ultraviolet stability. - Testing specimens shall be exposed for 300 hours at 1 sun intensity (0.2 to 0.4 micron range) in a pressure of 1 by 10^{-6} Torr or less. Check for conformance to 3.2.11. Testing to be accepted by traceability, and not by performing test on samples made from each individual batch.

5. PREPARATION FOR DELIVERY

5.1 Packaging. - The paint components shall be packaged in polypropylene containers suitable for handling and storage.

5.1.1 Containers. - When filled, the containers shall be sealed airtight and shall be free from any damage which could cause leakage.

5.1.2 Marking. - Each container of paint shall be marked with the batch or lot number, date of manufacture, manufacturer's name, date of purchase, and reference to this specification.

Code Ident. No.	DWO Size A	ITRJ-MD-C08089-SP9
		Sheet 7 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

5.2 Packing. - The paint shall be prepared for shipment in accordance with best commercial practices in a manner that will assure carrier acceptance and safe delivery and shall meet, as a minimum, the requirements of carrier rules and regulations applicable to the mode of transportation.

Code Ident. No.	DWG Size A	ITRI-MD-C08089-SP9
		Sheet 8 of 9

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL

6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) The quantity of material required.
- (c) Size containers required - quarts, gallons, etc.

6.2 Source of supply.

6.2.1 Paint ingredients. - The ingredients for compounding paint covered by this specification may be purchased from the following sources:

- (a) Zinc Oxide (SP-500) Zinc Corporation of America
300 Frankford Road
Monoco, PA 15061
- (b) Potassium Silicate Sylvania Electric Products, Inc.
(PS-7) Chemical and Metallurgical Division
Towanda, Penn. 18848
- or
- Potassium Silicate PQ Corporation
(Kasil 2130) Valley Forge, PA 19482

(Suggested changes together with suitable information should be directed to the Preparing Activity at AMCL/IITRI.)

Preparing activity;

Advanced Materials & Coatings Laboratory (AMCL)
IIT Research Institute
10 West 35th Street
Chicago, IL 60616

Code Ident. No.	DWG Size A	IITRI-MD-C08089-SP9
		Sheet 9 of 9

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.